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Biochimica et Biophysica Acta 1541 (2001) 1

BIOCHIMICA ET BIOPHYSICA ACTA
BBA

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Preface

Chloroplasts are of endosymbiotic origin, i.e. a photosynthetic bacterium was engulfed by an early eukaryotic host. During endosymbiosis most of the prokaryotic genes were transferred to the host nucleus. The loss of the transferred genes from the endosymbiotic genome could only occur after the successful establishment of a protein sorting, transport and distribution machinery. (i) Chloroplast targeting signals were 'invented' and added as cleavable presequences to the amino-terminus of the endosymbiotic gene products. (ii) A chloroplast outer membrane recognition and translocation complex was assembled partly from ancestral prokaryotic polypeptides. (iii) Further subunits, e.g. receptors, could be a eukaryotic invention, which might have evolved together with the targeting signals.

Translocation into the organelle is facilitated by molecular chaperones. Once inside the organelle imported proteins can follow different routes to their final destination. Most prominent are those into and across the thylakoid membrane, because they 'recycle' ancient pre-existing prokaryotic translocation pathways. The situation becomes even more complicated in complex chloroplasts which derived by secondary endosymbiosis. Complex plastids are surrounded by three or four membranes and hence cytosolic preproteins have to translocate through even more membranes.

The data which have accumulated in recent years from different prokaryotic and eukaryotic protein transport systems are starting to transform into a picture which allows us to outline general principles. I am indebted to the contributors who not only summarize what is known to date but try to put it into the context of other translocation systems. Therefore this volume is not only valuable to all researchers working in protein trafficking but also for teaching advanced courses in molecular cell biology. To meet the needs of a rapidly moving field such a special issue should be as 'fresh' as possible. As the editor, I want to thank the authors as well as the reviewers who agreed to meet a very tight schedule for their contributions. I am also thankful to the staff of Elsevier Science Publishers, particularly Pat Crowley, for their interest and support in the assembly and timely production of this volume.

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September 2001

PII: S0167-4889(01)00160-4